# Sel Ayre

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## Highlights

The sequence of deposits in the coastal section at Sel Ayre includes an interglacial peat, assigned to the Ipswichian, which is overlain by a succession of slope deposits and a till. These sediments have contributed significantly to the understanding of the Quaternary history of Scotland in an area well to the north of the main centres of glaciation.

## Introduction

Sel Ayre [HU 176 540] is located on the west coast of the Walls Peninsula on Shetland Mainland. It is a site of considerable scientific importance for the succession of Pleistocene deposits mulling a channel or gully on the cliff top. The deposits include peat that appears to have formed during an interglacial period, probably the Ipswichian. As the peat contains a different pollen assemblage from that recorded at Fugla Ness, the peats at the two sites are probably of different ages and represent the closing phases, at least, of two different interglacials. The sequence of deposits at Sel Ayre is described by Mykura and Phemister (1976), and the vegetation history has been reconstructed from pollen analysis of the peat by Birks and Peglar (1979).

## Description

The following sequence of deposits is revealed in the cliff section (Mykura and Phemister, 1976):

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| 10. Peat | 0.3 m |
| 9. Till, with clayey matrix and angular to subangular pebbles and boulders of Walls Sandstone (Old Red Sandstone) and rare basic lavas | 2.7 m |
| 8. Gravel, well-bedded with predominantly angular pebbles set in a silty to clayey matrix | 1.8 m |
| 7. Sand, pale brown with patchy brown iron staining; sparse pebbly bands, up to 0.23 m thick, more common at the sides of the channel | 1.4 m |
| 6. Sand, black to dark brown, limonite-impregnated and peaty | 0.025 m |
| 5. Sand, pale ochre-brown, pebbly, locally bleached white; patchily ochre-stained at base | 0.4 m |
| 4. Peat with scattered round sand grains and some sandy lenses | 0.038 m |
| 3. Soft, pale clayey sand with thin laminae of clay and peat | 0.23–0.26 m |
| 2. Peat with scattered sand grains in lower part; passes laterally into sand with thin peat bands and thickens to 1 mm | 0.45 m |
| 1. Sand with scattered pebbles, base not seen | 0.4 m |

The deposits lie within an ENE-trending channel. There have been no detailed sedimentological studies. However, work in progress (A. M. Hall and J E. Gordon, unpublished data) suggests that beds 1 and 4–8 comprise a series of slope deposits infilling the channel. The main peat bed (bed 2) splits laterally into a series of bands of sandy peat interspaced with sand lenses, often with ripple cross-laminations, as the section is traced from the centre of the channel to its edges. A radiocarbon date of 36,800 +1950/ –1960 BP (SRR–60) (Mykura and Phemister, 1976) has been obtained from the peat bed. This date is probably erroneous (Birks and Peglar, 1979; Sissons, 1981b).

The peat may have accumulated in a valley or basin mire within the channel or it may be highly compressed acid mor humus that accumulated within the channel. In the absence of any identifiable plant macrofossils, it has not been possible to distinguish between these two alternative origins. The pollen stratigraphy at Sel Ayre has been divided into three pollen assemblage zones (Figure 3.4) (Birks and Peglar, 1979).

## Interpretation

The vegetation at the time of the lowest pollen zone (SA–1, lower part of bed 2) appears to have been dominated by fern and herb-rich grasslands, possibly similar to the ungrazed communities rich in ferns and tall-herbs that are confined to cliff-ledges and islands in lochs in Shetland today. Such vegetation implies moderately fertile brown-earth soils.

Ericaceae dominated the vegetation of the succeeding pollen zone (SA–2, upper part of bed 2 and lower part of bed 3), suggesting acid humus-rich soils. Because of poor pollen preservation and the limitations of pollen morphology, it is not possible to say which taxa within the Ericaceae were abundant in the vegetation. The Balkan *Bruckenthalia spiculifolia* was present, however, along with a variety of calcifuge herbs and pteridophytes. Tree pollen values are low, as they are at Fugla Ness (Birks and Ransom, 1969) and in the Holocene sediments at Murraster (Johansen, 1975). In contrast to Fugla Ness, pollen of *Carpinus betulus, Quercus* and *Ulmus* are present at Sel Ayre. Also pollen of *Picea* and *Abies* are present in lower frequencies than at Fugla Ness.

The third pollen zone (SA–3) is restricted to the peat lenses (upper part of bed 3, bed 4 and bed 6) within the sands that overlie the main peat bed. The vegetation appears to have been open and grass-dominated with a variety of herbs characteristic of skeletal mineral soils.

In view of the stratigraphic setting of the Sel Ayre peat beneath 7.3 m of till, gravel and sand, and of the relatively low tree pollen values in Holocene pollen assemblages at Murraster (Johansen, 1975), even prior to any human disturbance, the Sel Ayre peat probably formed during an interglacial phase (but see Lowe, 1984). Numerical comparisons of the Fugla Ness, Sel Ayre and Murraster pollen assemblages (Birks and Peglar, 1979) indicate that the three sequences differ in their pollen composition, suggesting that they were formed in three different interglacials. The presence of *Carpinus betulus* pollen in the Sel Ayre profile suggests that the sequence was formed during the Ipswichian, as high *Carpinus* values are characteristic of its later phases in England (Phillips, 1974; West, 1977, 1980). The vegetational changes recorded at Sel Ayre suggest that the lowermost pollen zone (SA–1) reflects the mesocratic phase (*sensu* Andersen, 1966, 1969) of the Ipswichian, with fertile brown-earth soils. Pollen zone SA–2 represents the oligocratic phase (*sensu* Andersen, 1966, 1969), with acid podsols and peaty soils, and pollen zone SA–3 the cryocratic phase (*sensu* Iversen, 1958) of the Early Devensian, with skeletal mineral soils. The Sel Ayre sequence may thus represent an almost complete record of the Ipswichian on Shetland Mainland.

As in the case of Fugla Ness, the deposits at Sel Ayre merit detailed investigation to elucidate the glacial history of the area. The provenance of the sands and gravels interbedded with the peat has not been established and there is no information on glaciation of the site before deposition of the peat. The sequence of sands and gravels suggests a period of slope instability in the catchment prior to deposition of the overlying till (bed 9). The latter contains erratics of Walls Sandstone and rare basic lavas derived from the south-east (Mykura and Phemister, 1976), and may be correlated with the local ice-cap glaciation (Sutherland, 1991b). The latter is generally assigned to the Late Devensian.

If the correlation of the Sel Ayre sequence with the Ipswichian is correct (but see Sissons, 1981b; Caseldine and Edwards, 1982; Lowe, 1984) and the correlation of Fugla Ness with the Hoxnian and Gortian (or earlier stages) is correct, it would appear that there was very considerable regional variation in the vegetation of the British Isles in previous interglacials, just as there is in the vegetation of the present interglacial. The composition of the vegetation was, however, very different from one interglacial to another, a fact of considerable importance to plant ecologists and plant geographers.

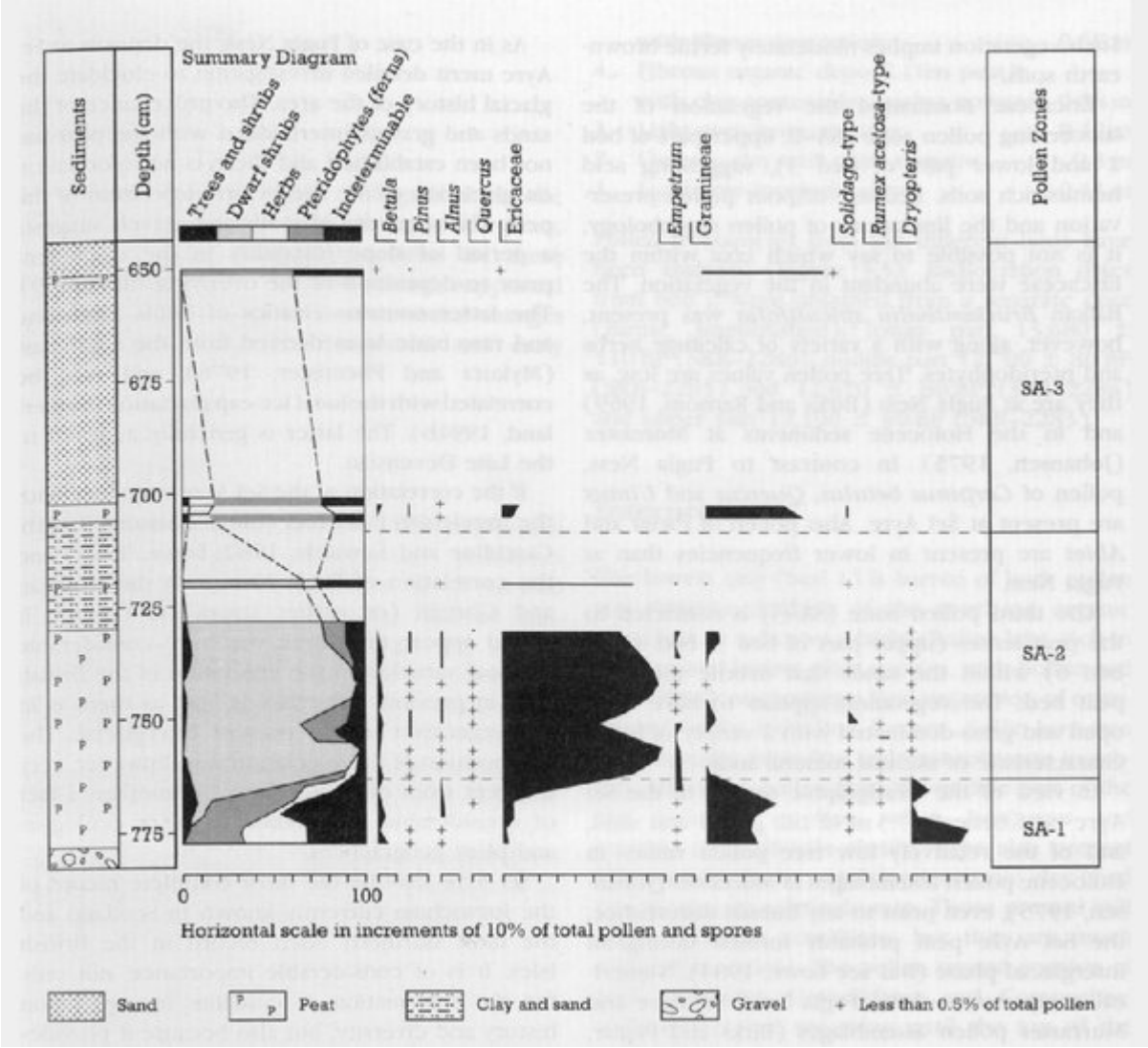
Sel Ayre may be the most complete record of the Ipswichian currently known in Scotland and the most northerly such record in the British Isles. It is of considerable importance, not only for the information it contains on vegetation history and diversity, but also because it provides a limiting date on the last glaciation of Shetland, probably by a local ice-cap

(Mykura and Phemister, 1976; Flinn, 1978a; Sutherland, 1984a).

## Conclusion

The sequence at Sel Ayre includes an interglacial (temperate climate) peat deposit, the most northerly in Britain that has been ascribed to the Ipswichian Stage (about 125,000 years ago). The pollen preserved in this deposit provides a valuable record of vegetational history, showing a succession from grassland, through heathland with trees, to open, grass-dominated vegetation. The deposits also indicate an episode of later glaciation (probably Late Devensian), preceded by a cold phase during which slopes in the catchment were unstable.

**References**




*(Figure 3.4) Sel Ayre: relative pollen diagram showing selected taxa as percentages of total pollen and spores (from Birks and Peglar, 1979; Lowe, 1984).*